

AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 03/03562
filed on October 27, 2003.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please replace paragraph [0002] with the following amended paragraph:

[0002] The invention is ~~based on a~~ **directed to an improved** method **of** and [[a device for treatment of the exhaust of an internal ~~combustion engine, as generically defined by the preamble to the independent claims. A method and a device of this kind are already known from DE 199 35 920, in which in order to prevent a urea/water solution from freezing at -11°C, heating tubes are provided in the reducing agent reservoir so that the reducing agent reservoir can be heated when reducing agent temperatures fall below 20°C.~~

Please add the following new paragraph after paragraph [0002]:

[0002.2] Description of the Prior Art

Please add the following new paragraph after paragraph [0002.2]:

[0002.4] A method and a device for treatment of exhaust gas are already known from DE 199 35 920, in which in order to prevent a urea/water solution from freezing at -11°C, heating tubes are provided in the reducing agent reservoir so that the reducing agent reservoir can be heated when reducing agent temperatures fall below 20°C.

Please replace paragraph [0003] with the following amended paragraph:

[0003] ~~Advantages of the Invention~~

SUMMARY AND ADVANTAGES OF THE INVENTION

Please replace paragraph [0004] with the following amended paragraph:

[0004] The method and device according to the present invention, ~~with the characterizing features of the independent claims,~~ have the advantage over the prior art of achieving a reduction in the freezing point of the fluid through concerted use of a conversion reaction of the auxiliary agent, in particular a decomposition reaction, without having to accept an appreciable temperature increase in the fluid system. At low outside temperatures, constant reheating is no longer necessary because after a concerted chemical conversion, ice no longer forms, even at low temperatures, and the heating does not have to be activated as long as the fluid contains a sufficient concentration of the substance produced by the conversion reaction.

Page 2, please delete paragraph [0005].

Please replace paragraph [0006] with the following amended paragraph:

[0006] Advantageous modifications and improvements of the methods and devices are also disclosed. It is particularly advantageous to carry out the stimulation in a partial region of the fluid volume contained in the tank and/or in lines so as to effectively enrich the fluid with the substance, without appreciably increasing the average temperature of the fluid.

Please delete paragraph [0008].

Please replace paragraph [0009] with the following amended paragraph:

[0009] ~~Drawing~~ **BRIEF DESCRIPTION OF THE DRAWINGS**

Please delete paragraph [0010].

Please replace paragraph [0011] with the following amended paragraph:

[0011] **Other features and advantages of the invention will become apparent from the description contained herein below, taken in conjunction with the single drawing figure, which** Fig. 1 shows a system for selective catalytic reduction of nitrogen oxides in the exhaust of an internal combustion engine.

Page 3, please replace paragraph [0012] with the following amended paragraph:

[0012] ~~Description of the Exemplary Embodiments~~

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please replace paragraph [0013] with the following amended paragraph:

[0013] In the sole **drawing** figure ~~[[1]]~~, the exhaust line 9 represents the exhaust line of an internal combustion engine, in particular a diesel engine of a motor vehicle. The exhaust 16 flows from the internal combustion engine through the exhaust line 9, passes a urea/water solution line (UWS line) 8 connected to the exhaust line 9, and finally arrives in a catalytic converter, not shown in detail, for selective catalytic reduction of nitrogen oxides contained in the exhaust. Downstream of the ~~[[SCR]]~~ **selective** catalytic **reduction** converter (~~“SCR”~~ ~~“selective catalytic reduction”~~ **hereinafter, SCR**), the exhaust flows through other devices, not shown in detail, for example other catalyzing units and/or a muffler, into the open-air. At the end opposite from the region feeding into the exhaust line, the UWS line 8 is connected to a urea/water solution tank 10. Between the tank 10 and the exhaust line 9, the line 8 contains a pump 6 and, between the pump 6 and the exhaust line 9, a metering valve 7 that can be cyclically triggered. The tank 10 contains a urea/water solution ~~[[UWS]]~~ with a urea content of for example 32.5% by weight. In a partial volume 13 of the tank 10 that is disposed in the lower region of the tank in the current exemplary embodiment, an electrical

heater 3 is provided; the supply of electrical power to the heater of the UWS in the partial volume is schematically indicated by the letters P_{EL} . On the upper side oriented toward the surface of the urea/water solution in the tank, a separating element 2 that is fastened to the side region of the tank forms an upper boundary of the heater 3, which is embodied as an electric heating coil. This boundary serves to define the region in which a significant heating or temperature increase of the fluid in the tank can occur. Lateral to the separating element and adjacent to it, a temperature sensor 4 and an ammonia sensor 5 are provided in order to determine the temperature and the ammonia concentration in the heatable partial volume. Above the fluid level of the urea/water solution, the tank 10, which can be closed by means of a closure device not shown in detail, is equipped with a pressure relief valve 11 that allows excess gas pressure to escape via a washing bottle 12 to which it connects. In addition, an electronic control unit 14 is provided that calculates, among other things, the intrinsically known functions of metering the urea/water solution into the exhaust train as a function of engine and/or exhaust parameters that are supplied to the control unit in a manner not shown in detail after being measured in the engine or exhaust train. In addition, this control unit 14 is connected to the temperature sensor 4 in order to evaluate a temperature signal 4a and is connected to the ammonia sensor 5 in order to evaluate an ammonia concentration signal 5a. A control signal line 3a can, for example, trigger a power transistor circuit, not shown in detail, in order to regulate the electrical heating capacity of the electric heater 3.

Page 4, please replace paragraph [0014] with the following amended paragraph:

[0014] The pump 6 and the metering valve 7 are triggered via triggering lines, not shown in detail, that are connected to the control unit 14 to supply a urea/water solution in an intrinsically known fashion to the exhaust 16 in a metered form in order to achieve, in the

NO_x-reduction catalytic converter not shown in detail below, a reduction of the nitrogen oxides contained in the exhaust in accordance with the method of selective catalytic reduction. In this connection, within the exhaust train, ammonia is derived from the urea/water solution supplied to the exhaust train and this ammonia selectively reacts with the nitrogen oxides in the SCR catalytic converter to produce nitrogen and water. In addition to the complete conversion of the urea/water solution into ammonia in the region of the exhaust train, in a partial region of the urea/water solution system comprised of the tank 1, line 8, pump 6, and metering valve 7, according to the present invention, the urea/water solution in the partial volume 13 of the tank 10 is heated to a decomposition temperature in a range above 60°C in order to stimulate an occasional, limited, partial decomposition reaction of urea to produce ammonia. The control unit 14 controls the heating capacity and the activation period of the heater as a function of the temperature and ammonia concentration values measured in the partial volume 13. This supply of heat occurs when a critical temperature value is reached or exceeded, which lies in a range from 0°C to -11°C, preferably in a range from -5°C to -10°C. In this connection, care is taken to assure a sufficiently high ammonia concentration in the entire fluid volume of the urea/water solution system in order to achieve a sufficiently significant reduction in the freezing point so that a subsequent reheating can be avoided even if the temperature falls below the critical value again. However, if the ammonia concentration has decreased to the point that a sufficient reduction in the freezing point is no longer assured, then the heating must be switched on again when the temperature falls below the critical temperature value. The ammonia concentration normally fluctuates in a range of between 7 and 20 percent, thus yielding a freezing point reduction in a range from 10K and 50K. It is particularly advantageous to establish a value of approx. 7 to 15 percent by volume of ammonia in the urea/water solution in order to reduce

the freezing point of the urea/water solution from -11°C to a range from -20°C to -30°C . The temperature of the urea/water solution is raised by 5K to 50K on average chronologically and spatially, and the pressure in the tank increases only slightly. The pressure relief valve 11 blows off any excess pressure generated by the escape of ammonia from the urea/water solution. Before the excess pressure is released into the environment, the gas passes through the washing bottle 12, by means of which the ammonia contained in the gas can be removed from the escaping gas in order to minimize the risk of environmental damage due to escaping ammonia. Up to 700 l of ammonia can be dissolved in 1 l of water. In the current exemplary embodiment, the tank volume is 60 l, so that at atmospheric pressure, 10 times the tank volume in pure ammonia can be dissolved in 1 l of water contained in the washing bottle 12. Either the state of the water in the washing bottle is monitored by means of devices not shown in detail or the water is replaced at regular intervals (for example after a fixed number of tank refills).

Page 7, please add the following new paragraph after paragraph [0015]:

[0016] The foregoing relates to a preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.